Instruction 51-1051
04-01-10

Copyright © 1999, 2004, 2006, 2010

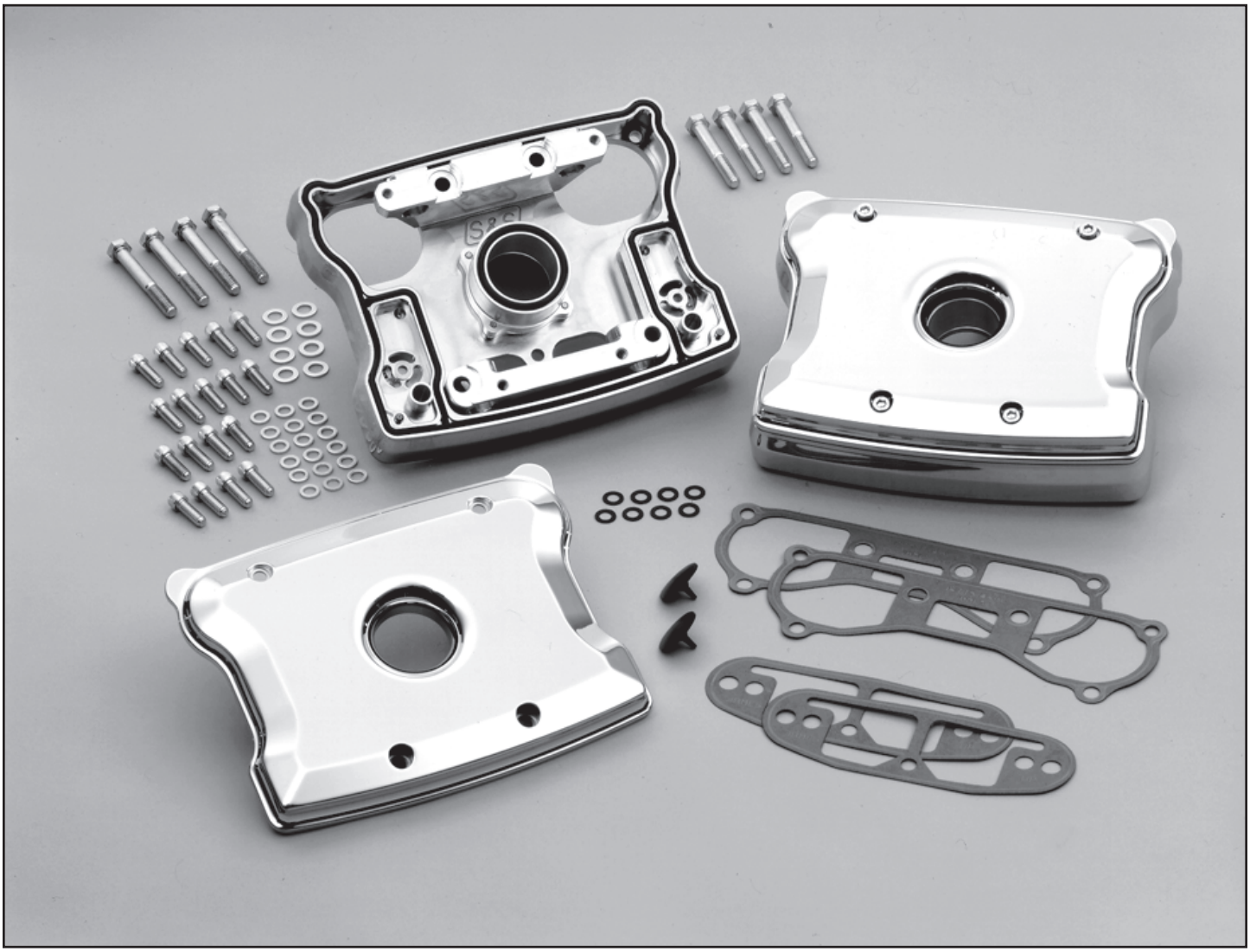
by S&S® Cycle, Inc.

All rights reserved.
Printed in the U.S.A.

S&S® Cycle, Inc.

14025 Cty Hwy G PO Box 215
Viola, Wisconsin 54664
Phone: 608-627-1497 • Fax: 608-627-1488
Technical Service Phone: 608-627-TECH (8324)
Technical Service Email: sstech@sscycle.com
Website: www.sscycle.com

Installation Instructions: S&S® Billet Rocker Cover Assemblies for Harley-Davidson® Evolution® Engines



Billet covers are manufactured from billet aluminum using computer-controlled machining centers. S&S® rocker covers include formed Viton® gaskets and o-rings for leak-free operation; our proven two-piece design makes for a simple installation.

DISCLAIMER:

S&S parts are designed for high performance, closed course, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely affect your factory warranty. In addition such installation and use may violate certain federal, state, and local laws, rules and ordinances as well as other laws when used on motor vehicles used on public highways, especially in states where pollution laws may apply. Always check federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his or her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

The words Harley®, Harley-Davidson®, H-D®, Sportster®, Evolution®, and all H-D part numbers and model designations are used in reference only. S&S Cycle is not associated with Harley-Davidson, Inc.

SAFE INSTALLATION AND OPERATION RULES:

Before installing your new S&S part it is your responsibility to read and follow the installation and maintenance procedures in these instructions and follow the basic rules below for your personal safety.

- Gasoline is extremely flammable and explosive under certain conditions and toxic when breathed. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.
- If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.
- Before performing any installation steps disconnect battery to eliminate potential sparks and inadvertent engagement of starter while working on electrical components.
- Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle with a S&S part on it.
- Consult an appropriate service manual for your motorcycle for correct disassembly and reassembly procedures for any parts that need to be removed to facilitate installation.
- Use good judgment when performing installation and operating motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgment. Start installation when you are fresh.
- Be sure all federal, state and local laws are obeyed with the installation.
- For optimum performance and safety and to minimize potential damage to carb or other components, use all mounting hardware that is provided and follow all installation instructions.
- Motorcycle exhaust fumes are toxic and poisonous and must not be breathed. Run motorcycle in a well ventilated area where fumes can dissipate.

IMPORTANT NOTICE:

Statements in this instruction sheet preceded by the following words are of special significance.

WARNING

Means there is the possibility of injury to yourself or others.

CAUTION

Means there is the possibility of damage to the part or motorcycle.

NOTE

Other information of particular importance has been placed in italic type.

S&S recommends you take special notice of these items.

WARRANTY:

All S&S parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at S&S's option if the parts are returned to us by the purchaser within the 12 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must call or write S&S immediately with the problem. Some problems can be rectified by a telephone call and need no further course of action.

A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly so as to not cause further damage and be returned prepaid to S&S with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. If after an evaluation has been made by S&S and the part was found to be defective, repair, replacement or refund will be granted.

ADDITIONAL WARRANTY PROVISIONS:

(1) S&S shall have no obligation in the event an S&S part is modified by any other person or organization.

(2) S&S shall have no obligation if an S&S part becomes defective in whole or in part as a result of improper installation, improper maintenance, improper use, abnormal operation, or any other misuse or mistreatment of the S&S part.

(3) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or for any other breach of contract or duty between S&S and a customer.

(4) S&S parts are designed exclusively for use in Harley-Davidson® and other American v-twin motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

INTRODUCTION

S&S® billet rocker covers are two-piece assemblies designed to fit most Harley-Davidson® Evolution® engines that accept stock style rocker covers.

NOTE: *At present, S&S billet rocker covers are not recommended for Buell® motorcycles because of interference with the front cylinder head-frame mount. S&S is currently testing a modified mount. Call Technical Services at 608-627-1497 for additional information.*

S&S rocker covers are machined from billet aluminum, then polished and chromed to a show quality finish. O-ring sealing insures reliable, leak-free operation.

NOTE: *Plain, unpolished and unplated versions are available for custom applications. They may be powdercoated or otherwise finished to individual specifications. S&S plain billet aluminum rocker covers must be inspected and burrs/sharp edges carefully removed by customer before installation.*

S&S rocker covers are designed to accept valve springs up to 1.660" O.D. with no modification. In most instances, they will accept valve lifts to .710" (S&S street head or OEM) or .810" (S&S Special Application cylinder head) without modification.

NOTE: *It remains engine builder's responsibility to check operating clearances. Clearances should be checked between valve spring/collar and rocker cover base as well as between rocker arm and top rocker cover. S&S recommends minimum of .060". Cylinder head must also be "set up" for correct lift.*

⚠ CAUTION

Failure to establish correct operating clearances can result in extensive engine damage not covered under the warranty.

S&S rocker covers are compatible with both crankcase and cylinder head vent arrangements. Provided umbrella valves 90-4030 must be installed for correct cylinder head vent operation, or combination crankcase-head venting as utilized in S&S big twin engines.

S&S rocker covers can usually be installed with engine in frame. Taller engines such as S&S 98" and 103" may require removal of engine for installation and removal of rocker covers.

INSTALLATION

1. Wash motorcycle, taking care to remove sand and other abrasive debris from engine and area of frame around engine. Remove battery, gas tanks, and all parts required to access original rocker covers. Remove top and center sections of rocker housings. Refer to authorized Harley-Davidson® Service Manual as necessary.

⚠ WARNING

Sparks from motorcycle electrical system can ignite gasoline fumes. To prevent sparks as well as prevent electric starter from becoming engaged inadvertently and causing personal injury, disconnect battery and remove from motorcycle before proceeding.

⚠ WARNING

Gasoline is toxic if fumes are inhaled, extremely flammable, and explosive under certain conditions. Do not smoke around gasoline, and perform installation in a well ventilated area away from sparks and open flame.

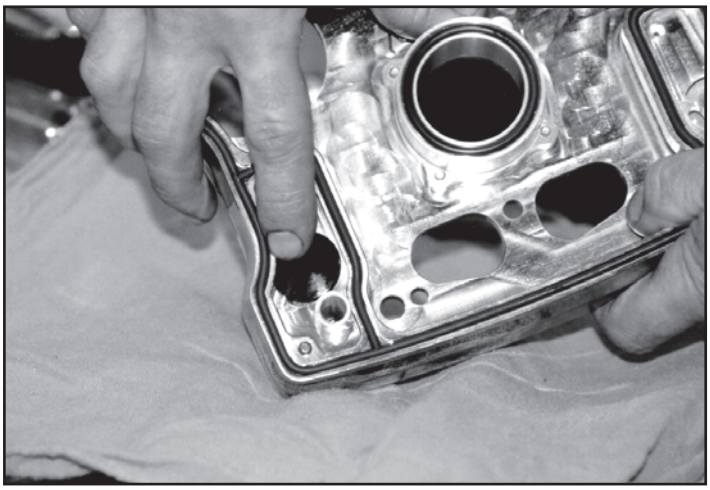
2. Remove pushrod cover retainer clips for front cylinder and collapse covers. Remove sparkplugs and rotate engine to place pushrods at lowest point on cam with front piston at TDC on compression stroke. Referring to Harley-Davidson® Service Manual as necessary, remove rocker assemblies, pushrods and lower rocker cover from front cylinder head.

NOTE: *Observe correct location of pushrods. S&S pushrod kits have longest pushrod for front exhaust, next longest for rear exhaust, shortest for rear intake, and remaining one for front intake. Remove all traces of old rocker housing gaskets from cylinder head, taking care to contain debris.*

⚠ CAUTION

Debris such as gasket material can interfere with oil circulation resulting in engine damage not covered under warranty.

3. Inspect S&S rocker cover assemblies. Remove rough or sharp edges from plain (unchromed) assemblies. Clean all metal parts with solvent. Dry with compressed air and remove any solvent residue with clean, lint free cloth.
4. Install umbrella valves in rocker cover bases. **See Picture 1.** Valves go in vent ports nearest intake manifold on both front and rear rocker cover bases.



Picture 1

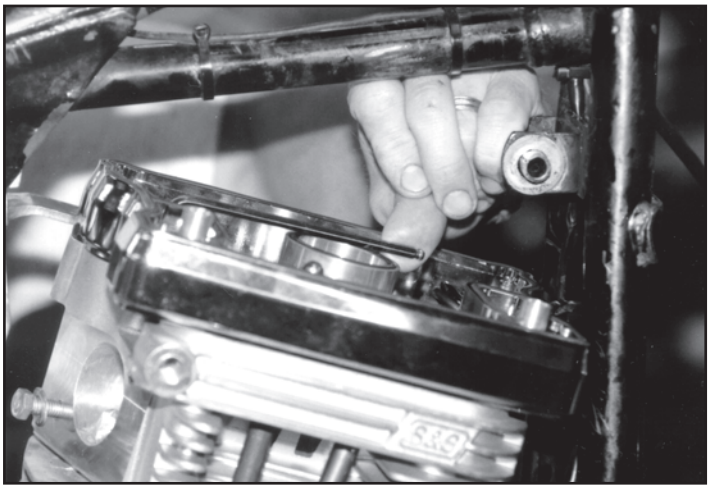
NOTE: *A thin coat of motor oil or light grease on stem of umbrella valve will ease installation. Valve often makes audible "snap" when correctly seated. Tug valve gently and visually inspect to confirm proper, secure fit before proceeding.*

5. Clean gasket surfaces of rocker cover base and cylinder head with lacquer thinner. Wipe dry with clean, dry cloth. Place right and left lower rocker cover gaskets on cylinder head with factory-applied silicone bead facing up.

NOTE: *A small dab of grease or gasket sealant of choice in corners may be used to hold gaskets in place. Otherwise they should be installed dry.*

6. Apply Loctite® 242 or equivalent to threads of 5 each ¼" screws with captured washers 50-0066 and install S&S® rocker housing base on cylinder head. **See Picture 2.** Torque screws to 10-13 ft-lbs.

NOTE : *If engine is in frame, it is easiest to place screws in housing base before placing housing base on head. Some screws are not accessible with standard hex key. S&S recommends cutting or grinding short end of key for access. Screws not accessible with torque wrench must be tightened by feel, using tightness of properly torqued screw as guide. (Last applies only if engine is in frame. All screws are accessible with engine out of frame.) S&S recommends using torque wrench whenever possible.*

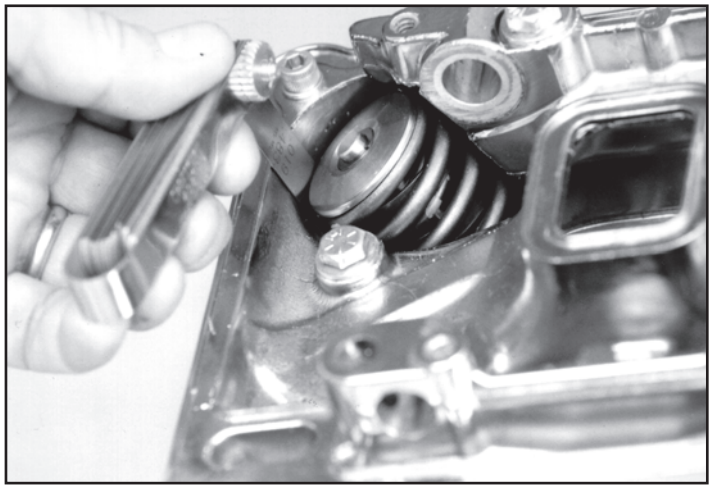


Picture 2

⚠ WARNING

Improperly tightened fasteners may cause damage not covered under warranty.

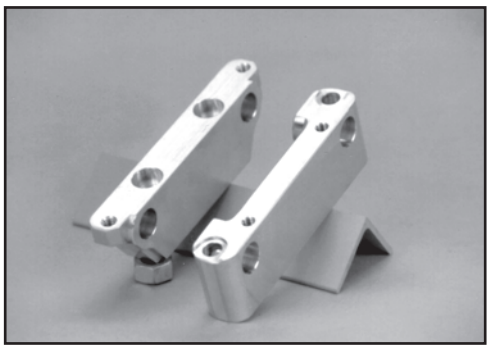
7. Measure clearance between valve spring and rocker cover with feeler gauge. Minimum is .060". **See Picture 3.** Same clearance must exist between rocker arm and top cover.



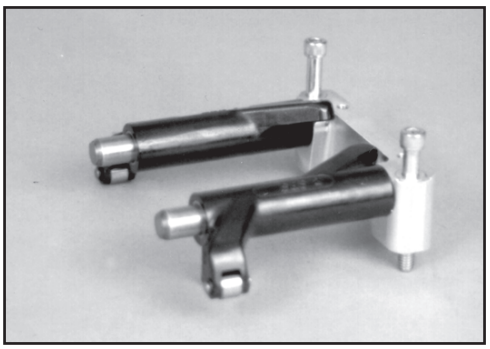
Picture 3

NOTE: *If less than .060" clearance exists between rocker and top cover, contact S&S Technical Services Dept.*

8. Assemble right and left rocker shaft supports. Inspect rocker shafts for burrs and deburr as necessary. Lubricate shaft for exhaust side rocker arm with assembly lube and pass through forward opening in right support. Relief in shaft must align with bolt hole indicated by arrow in **Picture 4.** Also note that relief in shaft support must face center of engine. Install flat washer on 5⁄16" x 2½" capscrew, pass screw through opening in support and apply Loctite® 242 or equivalent to threads. Lubricate rocker arm bushings and shaft and place exhaust side rocker arm on shaft. Repeat for intake and install second 5⁄16" x 2½" capscrew in support. **See Picture 5.**



Picture 4



Picture 5

NOTE: *S&S® has experienced minor clearance problems when installing some Harley-Davidson® rocker arms in S&S billet rocker covers. Procedure described in Step 9 should be performed prior to pushrod installation.*

9. To confirm adequate clearance between rocker arm and cover:
   A. Place rocker/support assembly in rocker cover base. Place left side support over ends of shafts and install 5⁄16" x 2¼" capscrews in support. Evenly tighten 4 capscrews in X-pattern to 15-18 ft-lbs. Slowly rotate rockers back and forth to insure that movement is free and without bind.

NOTES:

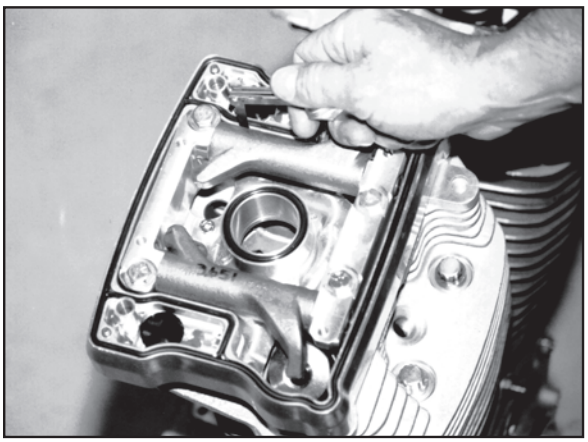
• Most Softail® frames require that right support be placed in lower rocker housing with rockers attached, then tilted up for installation of left support. In some applications, notably those with rubber mount engines and/or custom frames, both rocker supports can be installed on shafts and assembly placed in rocker housing base as single unit.

• Rocker arm supports have locating dowels in bottom surface. Dowels must align with openings in rocker housing base. Supports must pull down evenly

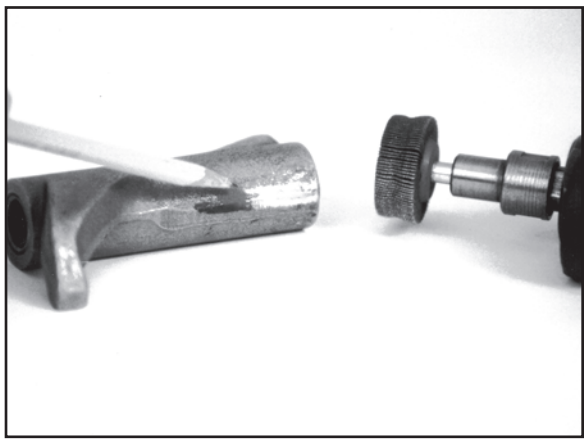
and without resistance. If resistance is encountered, loosen screws and shift supports to align dowels with openings.

B. Measure space between rocker arm and rocker cover with feeler gauge. **See Picture 6.** Minimum acceptable clearance is .025".

C. If clearance is less than .025", remove rocker arm from cover and carefully file or grind rocker arm to obtain correct clearance. **See Picture 7.**



Picture 6



Picture 7

⚠ WARNING

Metal particles are potentially hazardous, especially to hands and eyes. Always wear protective clothing such as goggles and gloves when grinding or filing metal. When using compressed air, always direct air stream away from yourself and others nearby.

⚠ CAUTION

S&S recommends clearancing rocker arm rather than rocker cover. However, removing excessive material may weaken rocker arm resulting in engine damage. In most instances, only a few thousandths of an inch of metal must be removed for correct clearance. Also, grind work piece for only brief periods to avoid overheating and possible alteration of heat treatment.

D. Remove burrs and smooth rough areas of relieved area with fine file or polishing wheel on hand held grinder. Clean rocker arm thoroughly with solvent and compressed air observing warning above.

⚠ CAUTION

Failure to remove burrs and metal chips may result in engine damage not covered under warranty.

E. Reinstall rocker arm and confirm correct clearance.

10. Check rocker arm endplay by sliding rocker arm as far to one side as possible and measuring gap between rocker arm and rocker arm support on opposite end. Acceptable endplay is .001-.012". If endplay is insufficient, carefully remove material from end of rocker shaft to achieve correct endplay, leaving smooth, nonabrasive surface.

NOTE: *If endplay is insufficient, remove minimum amount of material required to achieve correct measurement.*

⚠ CAUTION

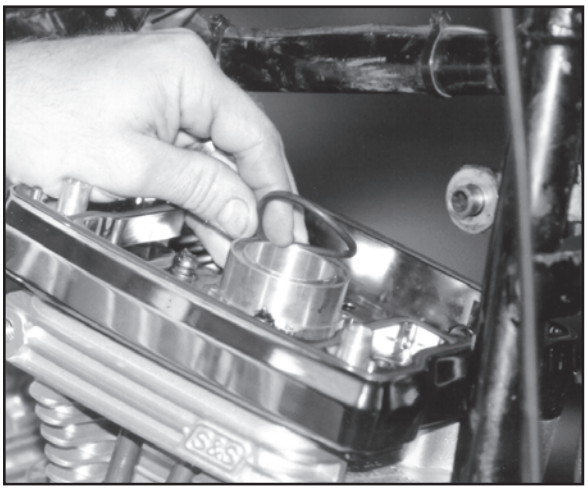
Failure to establish correct end play can result in engine damage not covered under warranty.

11. Remove rocker/support assembly and replace pushrods, insuring correct locations according to pushrod length. Lubricate valve tips and contact areas of rocker arms and reinstall rocker/support assembly as in previous step. Contact areas include roller, pushrod socket, and end thrust surfaces.

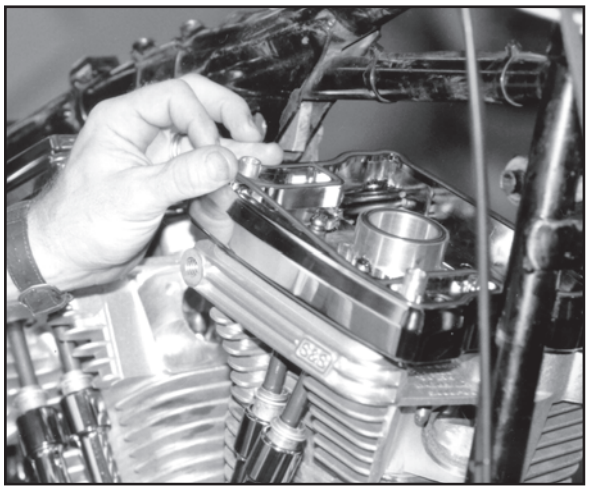
⚠ CAUTION

Insufficient clearance between rocker covers and valvetrain components may cause engine damage not covered under warranty. It remains the engine builder's responsibility to verify all operating clearances.

12. Confirm pushrod adjustment according to manufacturer's instructions and install pushrod cover retainers.
13. Place 1⅞" o-ring and Viton® gasket in rocker cover base. **See Pictures 8 and 9.** Install top cover with 4 each ¼" socket head screws, flat washers and fiber washers provided. (Fiber washers go between flat washers and cover.) Apply Loctite® 242 or equivalent to threads and tighten in X-pattern to 90-100 in.-lbs.



Picture 8



Picture 9

14. Remove covers from rear cylinder pushrods. Rotate engine to place pushrods at lowest point on cam with rear piston at TDC. Repeat procedures described in Steps 5-13.
15. Replace parts removed for installation, start motorcycle and inspect for gas and oil leaks.

NOTE: *Chrome scratches easily. Clean chrome with degreaser as necessary, then wash with hot soapy water. Rinse thoroughly before applying polish with a clean cotton cloth. Many waxes and polishes contain abrasives which will scratch chrome. S&S recommends non-abrasive polish specially formulated for chrome and has used Mother's Chrome Polish with good results.*

REPLACEMENT PARTS FOR S&S® BILLET ROCKER COVER FOR HARLEY-DAVIDSON® EVOLUTION®

1. Screw, SH - ¼"-20 x 3⁄4"
(Harley-Davidson® #4069A) *(12 Pack)* **50-0144**

2. Washer, flat - ¼"
(H-D® #6099)*(12 Pack)* **50-7013**

3. Washer, flat - ¼" rubber covered
(12 Pack) **50-7014**

4. O-ring – 1⅝" ID x 1⅞" OD x ⅛" CS Viton®
(Included in gasket set – See #19 below.)

5. Rocker cover umbrella valve
1992-'99 big twin, 1990-up xl® (H-D® #26856-89)
(Included in gasket set. See #19 below.)

6. Bottom rocker gasket - camside – steel
(H-D® #16778-84A) *(10 Pack)* **90-4062**

7. Bottom rocker gasket – driveside – steel
(H-D® #16779-84A) *(10 Pack)* **90-4063**

8. Rocker cover base – billet – 1984-up big twin and xl
Chrome **90-4051**
Plain **90-4056**
Polished **90-4081**

9. Screw, SH w/washer – ¼"-20 x 1"
(10 Pack) **50-0154**

10. Rocker cover o-ring gasket
S&S billet rocker cover
(Included in gasket set. See #19 below.)

11. Washer, flat – 5⁄16"
(10 Pack) **50-7028**

12. Bolt, rocker support
Socket head - 5⁄16"-18 x 2¼" (left support)
(H-D® #853A) *(10 Pack)* **50-0156**

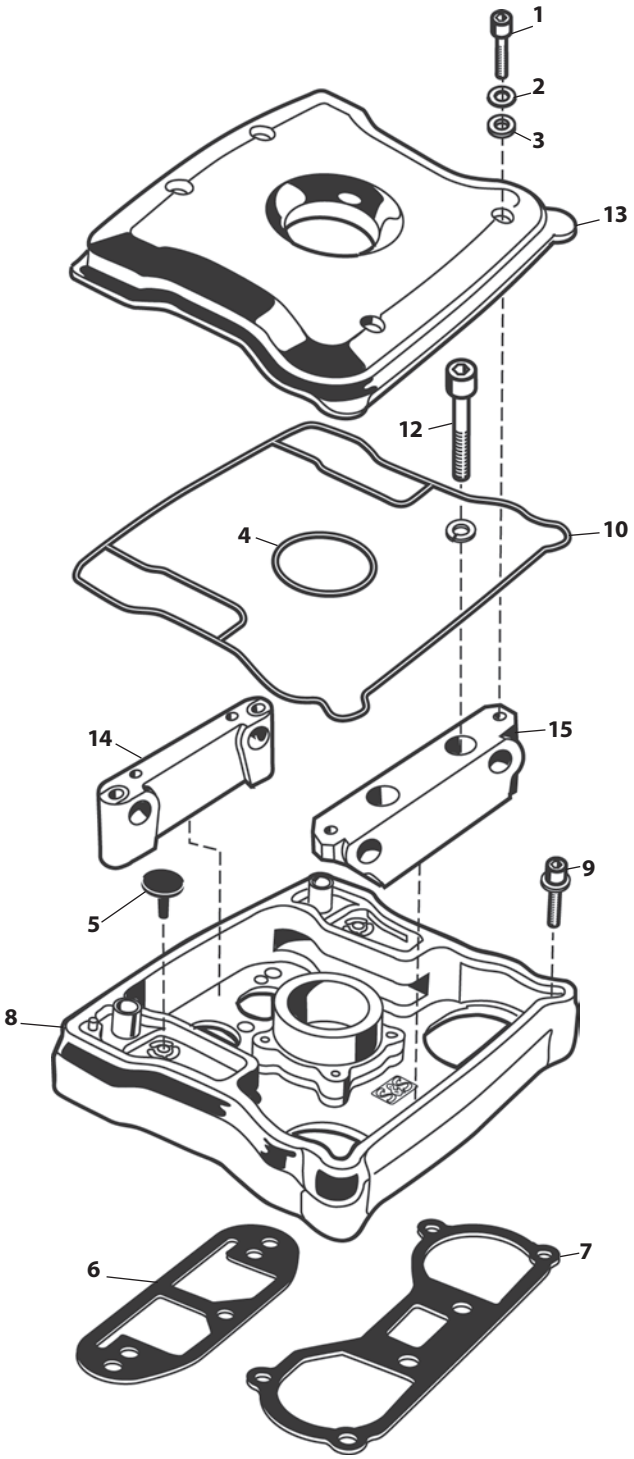
Socket head - 5⁄16"-18 x 2½" (right support)
(10 Pack) **50-0131**

13. Rocker cover top – billet – 1984-up
Chrome **90-4054**
Plain **90-4057**
Polished **90-4082**

14. Right rocker shaft support – billet
1984-up **90-4053**

15. Left rocker shaft support – billet
1984-up **90-4052**

16. Rocker cover gasket set
S&S billet rocker cover –
(Not shown) **90-4049**



All reference to Harley-Davidson® part numbers is for identification purposes only. We in no way are implying that any of S&S® Cycle's products are original equipment parts or that they are equivalent to the corresponding Harley-Davidson® part number shown.